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HIGH SCHOOL STUDENTS' NUTRITIONAL STATUS AND
THEIR ACADEMIC PERFORMANCE

A Thesis
Presented to the
Faculty of
California State University,
San Bernardino

In Partial Fulfillment
of the Requirements for the Degree
Master of Arts
in
Education:
Health Education

by
Edna Edith Holt
March 2007

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A Thesis
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March 2007


Approved by:



Dr. Kim Clark, Committee Chair



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3/14/07
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ABSTRACT

This descriptive study examines the relationship between nutritional practices and academic performance among school-age children as suggested in the literature review. Current research indicates that although there are many environmental and biological factors affecting academic performance, a major contributor to low academic performance is poor nutrition. In the current study, a questionnaire containing questions regarding nutritional practices and academic performance was administered to 469 students attending Norte Vista High School in Riverside, California. The sample was predominantly Hispanic (72.7%) and Caucasian (10.7%). Students answered 12 questions relating to nutritional practices and their grade point average. The Pearson Chi-Square Analysis was utilized to determine if statistically significant relationships existed. Variables that were significantly related to the students' grade point average as evident in the survey included breakfast consumption, bring lunch from home, and attendance ($p\text{-value} < .01$).

ACKNOWLEDGMENTS

I would like to extend my sincere gratitude to my research advisors Dr. Clark, Dr. Hughes, and Dr. Coleman. Your expertise, dedication, mentoring, advice, and encouraging words toward this project were invaluable to me towards completing my thesis.

I would like to express my deepest thanks to husband. To Mr. Compos, the Principal of Norte Vista High School, my deepest thanks for allowing this study to be conducted on his campus, as well as to Mr. Herreras the Assistant Principal, for signing the permission letter to conduct the study. A special thanks to Dr. Ali, an English teacher from Norte Vista High School.

A special thanks to all the science teachers from Norte Vista High School for giving up their class time to conduct this study. A heartfelt thanks to all the wonderful students from Norte Vista High School who willingly participated in this study. Last but not least, my sincere thanks to Mr. Tim Thelander for always answering his cell phone and assisting me with questions about formatting my thesis.

DEDICATION

I dedicate this thesis to my husband with love and gratitude for his love, understanding, patience, and support during my masters program. Also, I would like to dedicate this thesis to my daughter for her love and understanding.

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CHAPTER ONE

BACKGROUND

General Problem Statement

Poor nutrition or lack of nutrition is becoming a major problem among children and adolescents in the United States. Research indicates that in the United States, one out five American children are poor and more than 13 million American children 18 or younger live in poverty and are therefore undernourished (Alaimo, Olson, & Frongillo, 2001). Researchers are aware that there are many biological and environmental factors associated with students' poor academic achievements, the most prevalent being poor nutrition (Shariff, Bond, & Johnson, 2000). For instance, malnutrition in early infancy has a detrimental effect on cognitive development and as a result students' poor academic performance in later years (Shariff et al., 2000).

Poor nutrition may also be the leading cause of poor academic performance as well as an increasing rate of dropping out of school (Shariff et al., 2000; Alaimo et al., 2001; Galal & Hulett, 2003). Past and current research confirms that poor nutrition as well as malnutrition are associated with detrimental cognitive

development, which is the leading cause of emotional disturbances and poor academic performance (Alaimo et al., 2001). More rigorous research on nutritional practices among school-age children should result in a better understanding of the problem.

Alaimo et al. (2001) indicate that poor academic performances as well as poor social skills are associated with insufficient food intake. They also found that insufficient food intake causes children to display apathy. They note that children's motivation decreases and their anxiety level increases due to hunger. These behaviors may interfere with children's academic achievement, but can be easily rectified with proper nutrition (Alaimo et al., 2001). Further, children who are hungry are more likely to have poor attendance, be habitually late to school, or be receiving some type of special education services (Alaimo et al., 2001; Galal & Hulett, 2003; Shariff et al., 2000; Bryan, Osendarp, Hughes, Calvaresi, Baghurst, & Klinken, 2004).

Purpose of the Study

The purpose of this study is to determine the degree to which poor nutritional practices exist within a school-age population (ages 13-18) in a suburban school in

Riverside County, California. A second purpose is to detect any relationship between dietary practices and academic performance as alluded to in the literature. Recent studies indicate that malnutrition in early infancy has harmful effects on cognitive development, which leads to detrimental results on students' academic performance in later years (Shariff et al., 2000). It is probably safe to say that nutrition is essential for daily activities of school-age children. Most importantly, research indicates that nutrition is a necessary environmental component responsible for assisting the brain in critical thinking and problem solving (Anderson, Fenwick, Manly, & Robertson, 1998).

Significance of the Thesis

Current research demonstrates an important relationship between students' nutrition and their academic performance. According to Pollitt et al. (1996) malnourished children experience severe hunger symptoms, which may include gas and stomach ache. He also notes that hungry children are unable to focus and pay attention because their caloric energy level is very low. He adds that hunger symptoms disrupt the learning process resulting in poor academic performance.

All of the symptoms associated with inadequate nutrition or hunger make it difficult for students to concentrate effectively and learn every-day academic lessons; this problem can be modified with adequate nutrition (Pollitt et al., 1996). Some studies demonstrate that malnourished children would benefit more from a nutritious diet rich in protein, vitamins, and minerals to facilitate ideal brain function (Schoenthaler, Bier, Young, Nichols, & Jansens, 2000). Therefore, it is crucial to continue further research on the detrimental effects of poor nutrition practices and academic performance.

Three research questions were formulated for this study:

- 1) What are the dietary practices of high school children?
- 2) What is the academic performance of high school students and their nutritional status?
- 3) What is the relationship between students eating or skipping breakfast and/or lunch and students' academic performance? [Note: In this descriptive study, academic performance will refer to the grade point average (GPA) and attendance].

Thus far, research confirms that school-age students who skip breakfast suffer from symptoms of hunger (Pollitt

et al., 1996). As indicated by some researchers, the effect of poor nutrition can be easily reversed with the modification of a nutritious diet (Pollitt et al., 1996).

It is imperative to address such issues in this country through research and subsequent policies and programs development. Perhaps this current study can serve as a catalyst to continue a more in-depth research and find resolutions to improving school-age students' nutritional practices, and hence their overall academic performance. Findings also have implications for the expanding role of schools in non-academic areas of students' lives.

Limitations and Delimitations

This is a descriptive, research-based study of a non-random convenience sample from eight high school science classes. Although this study attempts to answer the research questions in a manner aligned to current research, it has limitations. For example, this study utilized a non-random convenience sample of high school students from Norte Vista High School (NVHS) located in Riverside County in Southern California. Since the participants were students from a single school campus, their nutritional patterns and habits were probably

similar to each other, and the findings cannot be generalized to the nutritional habits of the entire adolescent population.

This study did not account for parental parent income, parental marital status, or cultural beliefs. Moreover, this study did not try to determine whether insufficient food was a problem at home. In addition, this study did not focus on the meal preparation or type of food students consumed. This study only focused on the number of times students consumed breakfast and/or lunch per week, the number of times students were absent in a typical month of a school year, and their GPAs.

The following assumptions may apply to this thesis:

1. Eating breakfast will enhance academic performance.
2. Eating lunch will enhance academic performance.
3. Skipping breakfast interferes with the learning process.
4. Skipping lunch interferes with the learning process.
5. Breakfast is the most important meal of the day (McLaughlin, Bernstein, Crepinsek, Daft, & Murphy, 2002).
6. Hunger interferes with learning.

For this thesis, the following definitions apply:

1. Academic performance refers to grade point average (GPA) and school attendance.
2. Nutrition refers to the daily food intake.
3. School-age children refers to students from kindergarten to high school.
4. Breakfast refers to the first meal of the day.

CHAPTER TWO

LITERATURE REVIEW

This literature review section is an overview of the past and current research that pertaining to poor nutrition and its effects on academic performance. Moreover, this section includes studies that agree and disagree with this proposed research. Additionally, this section examines issues on the incidence of malnutrition among school-age students, the relationship between nutrition and cognitive development, and dietary practices and academic performance.

Incidence Factors of Malnutrition Among Children

It is startling that across the country, school-age children are consuming inadequate nutritious food, which may be the cause of many different problems as they reach adulthood (Alaimo, 2005). According to Alaimo (2005), there are about 13 million American children suffering from inadequate nutrition. Despite the efforts of federal programs and other participating programs, American families still are suffering from food insecurity or limited nutrition (Alaimo et al., 2001). Food deficiency and hunger lead to physical, psychological, deviant social

behaviors, and low academic performance (Alaimo, 2005; Center on Hunger and Poverty, 2002).

Poor nutrition is becoming the most prevalent and possibly the most controllable factor interfering with cognitive development as well as academic performance among school-age children (Alaimo et al., 2001). According to Alaimo et al. (2001) poor nutrition or malnutrition is one of the major factors associated with a detrimental cognitive development and poor academic performance. They mention that in many cases poor nutrition is a major factor leading to emotional disturbances.

Recent as well as previous research concludes that malnourished children have lower rates of school attendance, shorter attention span, severe lower academic scores, and a number of emotional and physical health problems than well-nourished children (Bryan et al., 2004). It has been well documented that malnourished school-age children cannot fully take advantage of educational opportunities if they do not have sufficient energy to perform well in school (Alaimo et al., 2001; Bryan et al., 2004; Galal & Hulett, 2003; Shariff et al., 2000; Levinger, 1996).

According to Levinger (1996), malnutrition is becoming an epidemic in most developing countries. In

fact, nutrition and health complications hinder the quality of biomechanics of children and encumber the developmental skill required to achieving a successful academic performance (Levinger, 1996). Levinger adds that malnutrition hinders the growth and cognitive developmental processes in children, and delays learning acquisition of school-age children.

Some of the detrimental factors leading to malnutrition are "protein-energy malnutrition" (p. 1) (PEM) and mineral deficiency, which lead to other illnesses such as vision, auditory, and anemia disorders (Levinger, 1996). Furthermore, Pollitt et al. (1996) reports that iron deficiency can have a profound effect on school-age children's learning development. Policy makers need to investigate alternative programs that include improved healthy nutrition intervention to eliminate at least one of the factors that hinder school-age children's learning (Levinger, 1996; Pollitt et al., 1996; Dixit, Houser, & Sampson, 1999).

The Relationship between Nutrition and Cognitive Development

Balanced nutrition is an important requirement of every living organism. The biological functions of the human body are interconnected and powered by the nutrients

found in food. The nutrients provided by food serve as fuel to support the proper function for every single cell of the human body (Lodish et al., 1996; Voet & Voet, 1995). This valuable information is confirmed by recent research conducted by Bryan et al. (2004) showing that although genetics and environmental forces affect development of the brain, poor nutrition has the most detrimental outcome on the brain and the cognitive processes of children.

Nonetheless, Bryan et al. (2004) indicate that it is very difficult to depict the influence that nutrition plays on the development of the brain and cognition due to other related factors such as demographics and social economics. However, it is very important to understand that this one factor, nutrition, is very easily modified in order to assist students in achieving their potential in brain development and cognitive processes. Also, he quotes the study by Wachs (2000) which indicates that poor nutrition in fact has detrimental affects on brain development.

Bryan et al. (2004) indicate that Wachs' study demonstrates that poor nutrition impairs the proper function of the hippocampus, the myelination of neurons, and the operation of neurotransmitters. These brain

components are all responsible for appropriate function of cognitive development and processes necessary for critical thinking and to solve problems (Bryan et al., 2004; Lodish et al., 1996; Voet & Voet, 1995; Shariff et al., 2000).

The conclusions of Bryan et al.(2004) agree with the study of Shariff et al.(2000), indicating that poor nutrition in early infancy could severely affect cognitive development, which is essential for learning. Shariff et al. (2000) speculate that many factors could impair the learning process necessary for academic achievement, but nutrition has a greater impact on students' school attendance or the ability to stay focused. For example, they indicate that poor nutrition can lead to emotional disorders such as "irritability, moodiness, and short attention span that can disrupt the child's learning process" (p. 265).

Furthermore, Shariff et al. (2000), indicate that inadequate nutrition has a direct link to behavior problems, which in turn affects academic performance. Poor nutrition may lead to psychological disorders and as a result may ultimately be one of the leading causes for low GPA and dropping out of school (Shariff et al., 2000; Bryan et al., 2004).

Malnourishment is becoming an epidemic even in well-developed countries. According to Sigman and Neumann (1989), about 48% of adolescent children in Africa are malnourished. They indicate that children who are severely malnourished are easily detected because of their physical appearance, but moderate malnutrition is difficult to identify because it requires detection by other measurements.

There is not enough understanding about the ramifications of malnutrition, whether it may be mild or moderate, but the consequences may be detrimental (Sigman & Neumann, 1989). That study also denotes that mild or moderate malnutrition is more prevalent than severe malnutrition and possibly has greater implications regarding the cognitive abilities of children. It also indicates that their investigation was aimed to rule out several factors associated with cognitive development. Their results reveal that nutrition, school activities, and family structure are all connected to cognitive development. In addition, they concur that there is a definite relationship between nutrition and cognitive skills regardless of students' social or economic status.

The Relationship between Poor Nutrition and Early Brain Function

A study entitled *Early Childhood Supplementation on the Educational Achievement of Women* reported by Haojie et al. (2003), suggests that malnourishment during early infancy has ramifications during adulthood causing cognitive disadvantages such as lower academic performance. They suggest that infancy malnutrition is becoming an escalating public health problem.

Early infancy care includes prenatal care and the first two years of infancy (Haojie, Huiman, Barnhart, Stein, & Martorell, 2003). Haojie et al. (2003) indicate that early infancy care is critical to the health of children because brain development is at risk due to malnourishment and is associated with undeveloped cognitive skills.

The study by Haojie et al. (2003) took place in a remote village in Guatemala. The study participants included 130 pregnant females who were exposed to either a drink called Atole containing 6.5 grams of protein, or Fresco without protein. Their children were assessed at two years of age, and again at 22 and 29 years, by knowledge, numeric skills, and several reading tests. The results of their study indicated that females exposed to

the drink Atole had better academic performance than those exposed to the drink Fresco. This led the researchers to their conclusion that better nutrition leads to better academic performance.

Haojie et al. (2003) state that from their previous research in Guatemala, "supplementation with a nutritional supplement providing during prenatal and during the first two years of life significantly improved educational achievement" (p. 1156). Moreover, they state that better nutrition is essential for brain growth and cognitive development as well as comprehension during the teenage years. Unfortunately, research indicates that too few studies have been done in this area of long-term ramifications of early infancy and malnutrition relationship (Haojie et al., 2003); Dugdale & Chen, 1977).

The Relationship between Diets Rich in Vitamins and Cognitive Processes

Researchers have been torn between data indicating that poor nutrition hinders academic performance and data that disprove these results. Thus, in order to provide more conclusive information, Schoenthaler et al. (2000) reported that two independent teams conducted a randomized double-blind, placebo control investigation in which school-age children were subjected to a low-dose of

vitamin-mineral tablets to improve nutrient intake corresponding to a well-balance meal or diet. Surprisingly, both teams reported conclusive evidence of increases in nonverbal intelligence among the participants.

Schoenthaler et al. (2000) indicate an important discovery among 125 children who received an active tablet and an increase of 15 or more intelligence quotient (IQ) points as compared with placebo subjects. Their results are significant because they show an improvement of intelligence processes. Also, their findings lead to the conclusion that a poor diet, low in vitamins and minerals, has a huge ramification on desired academic performance. Furthermore, the results of their study indicate that malnourished children would benefit from a diet rich in vitamins and minerals to facilitate ideal brain function.

These positive results provide evidence that malnourished children may increase their intelligence by consuming a well balanced diet rich in vitamins and minerals (Schoenthaler et al., 2000). On the other hand, children who already consume a standardized diet or a well-balanced diet are at their optimal level of ideal brain function and will not show much improvement

associated with an increase of academic performance (Schoenthaler et al., 2000).

In addition, an extensive body of literature shows that vitamin supplementation improves scholastic performance, especially for undernourished children, and the most valuable information from a clinical view is that the benefit is greater for minority children (Schoenthaler et al., 2000). Moreover, research confirms that one out of five children are considered malnourished enough to prevent proper brain function (Schoenthaler et al., 2000).

Furthermore, Pollitt et al. (1996) states that vitamins and minerals obtained from a nutritious diet or vitamin supplement may prevent brain dysfunction. He explains that neurodevelopment of normal children could be at risk if they have iodine and iron-deficiency. Pollitt et al. (1996) also adds that iron-deficiency is detrimental to the human body because it is the leading cause of anemia, especially among school-age children. Additionally, his results indicate that "iron-deficiency is one of the factors that could lead to short attention span and prevent concentration" (p. 13) which can hinder the learning process and related activities in school. The interesting fact is that vitamin and mineral deficiency which is responsible for hindering school performance may

be easily resolved by providing a nutritious diet or a vitamin-mineral supplement along with an improved diet (Pollitt et al., 1996).

The Relationship between Improved Diet and Cognitive Processes

A report from Thatcher and Lester (1985), suggests that a diet high in refined carbohydrates can agitate or induce negative behavior disorders and impair learning abilities, which is an indication that poor diet may influence school-age children's school performance. Furthermore, their report demonstrates that upon reviewing their subjects' history, behavioral disorders seem to diminish with improvement in their diet. These results demonstrate that there is a powerful link between a nutritious diet and students' behavioral and learning achievement (Thatcher & Lester, 1985).

Furthermore, research in the area of nutrition indicates that an improvement of diet seems to be the key factor of improving irritability, hyperactivity, and short attention span (Thatcher & Lester, 1985). According to these authors, learning disorders and behavioral patterns may be improved by enhancing dietary intake. They also indicate that an improved diet may play a significant role in the improvement of students' psychological behavior as

it is a significant ecological factor which affects neuropsychological function.

Thatcher and Lester (1985) also indicate that the majority of studies point directly to poor diet or nutrition as being the root factor of behavioral problems and learning disabilities. They imply that to improve academic performance, one must start at the root of the problem by improving dietary intake and nutrition for school-age children. Research indicates that a nutritious diet will in fact improve neurological problems such as irritability and short attention span, and that it is the number one ecological factor that affects the most sensitive functions of cognitive learning and academic achievement (Thatcher & Lester, 1985; Schweitzer, 2005; Berkey, Rockett, Gillman, Field, & Colditz, 2003; Levinger, 1996; Pollitt et al., 1996; Alaimo et al., 2001).

Pollitt et al. (1996) states that protein-energy malnutrition (PEM) during the early years of childhood affects cognitive development and the learning process. He also adds that school-age children at risk of malnutrition with a record of chronic PEM are physically and mentally challenged in school activities. Pollitt et al. (1996) indicates that the health of school-age children at risk

of malnutrition or with chronic PEM was restored after receiving a proper diet.

Additionally, he indicates that children's physical and mental challenges diminished after receiving adequate nutrition. Although, Pollitt et al. (1996) research focus was to investigate the effect of poor nutrition and health status in children from developing countries in Africa, Asia, and Latin America, his results apply to any school-age child who is not receiving the proper nutrients via food or vitamin supplements. His results have a strong message that school-age children require certain nutrients to ensure the proper neurological and physiological function to improve academic performance.

Finding the relationship between nutrition and cognitive processes is challenging because there are many controversial factors (environmental genetic, and nutritional) that make it difficult to determine if one or all are responsible for cognitive development (Bryan et al., 2004). Research points to poor nutrition as one of the obvious factors directly or indirectly responsible for poor cognitive processes (Bryan et al., 2004). Researchers Bryan et al. (2004) consider that while nutrition is one factor responsible for poor cognitive process it is the

simplest factor that can be adjusted to enhance school-age children brain functioning.

More to the point, Bryan et al. (2004) suggest that poor nutrition may have a detrimental effect on the brain. According to them there is a crucial time from gestation to approximately two years of age in which the brain is developing and is very susceptible to nutritional deficiency. They also mention that the brain continues to develop from gestation, to childhood and even during adulthood; hence, nutrition is an essential component from gestation to adulthood to ensure proper brain function. Moreover, they indicate that PEM in the early years of life can have profound effects on academic performance, and continues through school-age children eight to nine years of age and in some cases up to 15 years of age. The implication is that dietary components maintain the function of the brain as well as the neurotransmitter process.

Current research proves that it is wise to eat a variety of nutritious food to support proper brain function (Wolfe, Burkman, & Streng, 2001). To maintain proper brain function, as recommended in the science of nutrition, it is important to consume protein, fat, B vitamins, iron, choline, and antioxidants (Wolfe et al.,

2001). For example, Wolfe et al. (2001), provide a list of sources of nutrients and their roles on brain functioning.

- Iron, for instance, transports oxygen to [the] brain, and is involved in red blood cell formation.
- Protein provides the amino acid tyrosine needed for the release of key neurotransmitters, resulting in increased alertness and motivation.
- Fat, in combination with protein, sustains glucose breakdown for longer periods of time.
- Fat-soluble vitamins A, E, and K are essential in the formation of nerve cell membranes.
- Choline is needed to produce acetylcholine, low levels have been associated with memory loss.

(Wolfe et al., 2001, p. 17)

Wolfe et al. (2001) quoted Garrison and Somers (1995) assertion that B-vitamins promote the body's ability to use glucose. Thus a diet rich with these components would prove beneficial to brain function, which in terms would improve school-age students' attention span (Bryan et al., 2004; Wolfe et al., 2001; Hughes & Bryan, 2003).

According to Bryan and Hughes (2003), the brain develops at different rates, gestation period being the

crucial period for its formation. Then they add that from infancy to adulthood, the brain structures responsible for focus and attention continue to develop.. Hughes and Bryan cite Nelson (1998) in which he states that the frontal lobes develop in segments starting from the day of birth to two years of age, from seven to nine years of age, then around 15 years of age. According to Hughes and Bryan, researcher Goldman-Rakic (1987) confirms that the frontal lobes seem to be the central part of the brain.

Moreover, Hughes and Bryan (2003) say that researchers Anderson, Fenwick, Manly, and Robertson (1998) and Rabbitt (1997) indicate that frontal lobes are very influential for carrying out higher-order cognitive processes; that is to say, designing and developing strategies. Hughes and Bryan also add that the frontal lobes are important for testing hypotheses when solving problems, including the recalling information and the ability to focus. They note that these intelligences emerge during childhood. They also indicate that different environmental and biological factors can influence how the brain functions from infancy to adolescent.

According to some researchers, nutrition is an essential component for a healthy development of the brain (US Department of Agriculture, 2003). Other researchers

confirm that the brain is susceptible to malnutrition with different impairments in the biochemical development, leading to disruption of brain function (de Souzaa et al., 2004). Hughes and Bryan (2003) quote Wachs, who states that since nutrition is a segment of the youngsters' biological environment it can have great ramifications on the development of the child's brain, which can hinder the development of the frontal lobes, and proceed to hinder the child's memory and cognitive abilities.

Much more research is needed to learn about nutrition and its effects on cognitive processes. Research seems to point directly to a lack of adequate nutrition and the function of the brain at different intervals of development, especially during infancy and childhood (Hughes & Bryan, 2003). Anand (1999) Executive Director, USDA Center for Nutrition Policy and Promotion, concludes that inadequate nutrition has ramifications on the cognitive processes of school-age children and their ability to function in adulthood. Inadequate nutrition has detrimental effects on behavior, attendance, academic performance, and overall performance of school-age children. Anand (1999) states that the USDA provides funds to feed breakfast daily to approximately 7.2 million school-age children. In spite of these efforts, many

teenagers go without breakfast every day. Roscoe and Gold (1999) also indicate that the brain performs better or after the consumption of food.

According to a nutritionist from Kaiser Permanente, school-age children who eat breakfast every morning may improve their academic performance. She notes that nutrition is necessary for students to focus and concentrate on their work (personal conversation). In addition, school-age children who eat lunch every day may improve their academic performance, but in contrast, hungry children cannot think (personal conversation). A healthy lunch will feed their brain cells as well as their bodies (personal conversation).

The Relationship between Dietary Practices and Academic Performance

Many policies have been implemented in an effort to reduce the disadvantages school-age children face in society (California School Boards Association & California Project LEAN, 2005). A minimum of 80% of school districts in California depend on the California School Boards Associations' (CSBA) Policy Services to assist them in meeting their own food and physical policies requirements (California School Boards Association & California Project LEAN, 2005).

In spite of the programs and policies regarding school-age children's nutrition, little has been done to address Hispanic school-age children's poor nutrition practices and academic performance. The composition of food served to children is of importance because many students are exposed to unhealthy amounts of fat, sugar, and salt (Brown et al., 2004). Recent research indicates that the food sold in schools is high in fat, sugar, sodium, and calories, and low in fiber because these foods are "popular, and thus create revenue for the schools" (Brown et al., 2004, p. 52).

According to Brown et al. (2004), school cafeterias have tremendous influence on students' dietary choices, which could influence the child's nutritional habits for a lifetime. As a result of consuming these foods, chronic diseases such as obesity, high blood pressure, and diabetes are perpetuated in adults (Brown et al., 2004; Wolfe et al., 2001). The school is the place where students spend the major part of the day. The school cafeteria is the place where students can learn to make healthy food choices early in life to ensure enhanced physical and cognitive development (Wolfe et al., 2001).

Students' poor eating habits are at epidemic levels, and this is primarily true for the consumption of sugar

and fat by adolescents (Brown et al., 2004). According to Wolfe et al. (2001), adequate nutrition and exercise are strongly connected to students' academic performance. In addition, they (2001) indicate that adequate nutrition is essential to "maximize brain functioning and to enhance learning" (p. 16). They argue that healthy nutritional habits do not have to involve expensive foods or supplements; the key is to teach students and their families to make healthy food choices early in life to ensure enhanced physical and cognitive development. Moreover, Wolfe et al. (2001), show the correlation of proper nutrition and brain function to well balanced nutrition.

Recent studies indicate that young children and adolescents need to be exposed to a variety of foods and that educators need to impart knowledge of the recommended servings from the five groups of the pyramid guide to students and parents (Wolfe et al., 2001). Researchers stress the idea that students and parents need to learn recommended sizes and portions of a variety of foods to adequately consume balanced and moderate portions from the five groups of the pyramid guide (Wolfe et al., 2001). Wolfe et al. indicate that the easiest method to increase cognitive function, test scores, and school attendance is

by simply providing a well-balanced breakfast. What is more, they recommend a balanced breakfast containing the recommended quantities of "protein, fat, starch, and sugar [that] will prevent drops in blood sugar for several hours, whereas a breakfast of just starch and sugar will sustain a child for only one to two hours" (p. 17) meaning that the student's attention span will be that long or less.

Shariff et al. (2000) state that there are several factors involved with nutrition and academic performance. For example, they indicate that biological, psychological, socioeconomic, and cultural factors may be associated with nutrition and academic performance. Although they consider many factors that contribute to poor nutrition, they concur that poor nutrition may be the major factor that contributes to poor academic performance. Shariff et al. (2000) agree that poor nutrition in early development has a detrimental effect on cognitive development, which could hinder the learning process necessary for successful academic performance. Consequently, poor nutrition may be an indirect effect upon educational dropout, poor attention span, poor attendance, and negative mood swings, hindering the learning process, which would be a direct

effect on an unsuccessful academic performance (Shariff et al., 2000).

Kleinmana et al. (2002) conducted a study to determine the relationship between nutritional intake and academic and psychological performance. They observed an improvement after the implementation of a universal free school breakfast program (UFSBP). They collected data from 97 inner city students before the program (UFSBP) was implemented, and then six months later. Kleinmana et al. (2002) reported that "Students who had total energy intakes of <50% of the recommended daily allowance (RDA) and/or two or more micronutrients of <50% of RDA were considered to be at nutritional risk" (p. 25). Their report concluded that one third of the students were under the classification of being at "nutritional risk" (p. 26).

This study by Kleinmana et al. (2002) led to the conclusion that students at "nutritional risk" (p. 26) were less likely to eat breakfast at school. They indicated that these children were more prone to poorer attendance and lower grades and pointed out that students at "nutritional risk" (p. 26) showed more behavior problems. After participating in the free school breakfast program for six months, students showed a drastic improvement in attendance, school participation, math

grades, and overall behavior compared to children who did not participate in the free school breakfast program. Those students remained at "nutritional risk" (p. 26).

The Benefits of Eating Breakfast and the Disadvantages of Skipping Breakfast

In a study entitled *The Food Insufficiency and American School-Aged Children's Cognitive, Academic, and Psychosocial Development* by Alaimo et al. (2001), children were classified as food insufficient if a parent or guardian reported that there was insufficient food to eat. Their results demonstrated that poor academic performance and poor social skills are associated with insufficient food intake. It is surprising that in a country like the United States, there is so much poverty and hunger among school-age children. As mentioned earlier, one out of five American youngsters are poor and more than 13 million American children 18 years old or younger live in poverty and therefore are undernourished (Alaimo et al., 2001).

Research provided by Alaimo et al. (2001) shows that malnourishment is associated with detrimental cognitive development and poor academic performance, leading to emotional disturbances. In addition, they say that children who are associated with hunger symptoms are more likely to have behavior problems, poor attendance, and be

habitually late to school. Moreover, children who demonstrate hunger symptoms are more likely to be receiving some type of special education services.

Alaimo et al. (2001) conclude that malnourishment in children six to eleven years old has been associated with low arithmetic scores or being held back a school year. Moreover, they suggest that children with inadequate nutrition have a higher probability of seeing a psychologist for emotional distress and are more often suspended from school. They also mention that students who suffer from hunger are somewhat antisocial and have tremendous difficulty in making friends with other students. Children with symptoms of hunger are more likely to be irritable and distracted, which will interfere with school performance and bring about negative behavior problems at school (Alaimo et al., 2001).

A study by Galal and Hulett (2003) found a strong link between malnutrition and academic performance. It is reported that policy makers have recognized several factors linking poor academic scores, attendance, and the quality of education to social and economic status, and are eager to improve the quality of education by demanding standards based curricula and subject competency (qualified) teachers (Galal & Hulett, 2003). However,

researchers agree that policy makers have failed to recognize that health and nutrition are key factors for improving school-age children's academic performance (Galal & Hulett, 2003).

As stated in the *Student Wellness Resource Guide* (2005), school-age children benefit greatly from eating breakfast in school because it seems to improve academic performance, such as math, and reading scores as well as the ability to stay focused (California School Board Association [CSBA], 2005). Some researchers report that eating breakfast is related to higher academic performance. On the other hand, skipping breakfast has been associated with poor academic performance (CSBA, 2005). Other researchers confirm that students who skip breakfast had lower daily intake and tend to gain weight because they are inclined to eat more unhealthy snacks (Berkey et al., 2003).

Consequently, the overall result of skipping breakfast is the negative effect on academic achievement, which is reflected in lack of energy and inability to do simple school tasks (Berkey et al., 2003; Cueto, 2001). Researchers emphasize that breakfast is the most important meal of the day, even though its consumption has a

short-term effect in improving some learning skills (Cueto, 2001).

The investigation by McLaughlin et al. (2002) entitled *The Evaluation of the School Breakfast Program Pilot Project* (ESBPPP), a multi-year research study with the assistance and cooperation of many school districts, indicates that breakfast is the most important meal of the day. Although skeptical, they indicate that studies reveal that eating a nutritious breakfast is associated with increased improvement of academic performance. In an effort to increase academic performance one can insist on implementing free breakfasts for all school-age children, no matter what the students' socioeconomic status or ability to pay for school meals (Berkey et al., 2003; Cueto, 2001).

According to the ESBPPP (2002), a nutritious breakfast is the most important meal of the day because it is directly associated with an improvement in dietary status and academic performance. This means that students' health and academic achievement should start to improve (McLaughlin et al., 2002). The vision for the future is to have a free breakfast program with the outcome of more school-age children eating a more nutritious first meal of the day, which will enhance their readiness to learn by

providing the energy they need (Berkey et al., 2003; Cueto, 2001).

Many researchers have documented an extensive body of data supporting the relationship between nutrition (especially a nutritious breakfast) and school performance. Many are still skeptical about the idea that a nutritious breakfast makes any difference in the well-being of the school-age children. Perhaps members of the ESBPPP (2002) are enthusiastic about this approach because it will encourage more students to consume a nutritious first meal of the day. However, they (2002) are also very concerned because this will increase the cost to the federal government; therefore, the ESBPPP (2002) needed to be certain that the free SBP participation will in fact improve the dietary intake and academic performance.

As a result, ESBPPP (2002) conducted their own study in the spring of 2001. Their study consisted of 79 treatment and 74 control schools in the School Breakfast Program Pilot Project. They measured dietary intake, cognitive function, and weight and height. ESBPPP data indicate that the free SBP doubly increased the students' participation, but had little effect on academic performance.

Furthermore, data collected by McLaughlin et al. (2002) in a similar study indicated that there was no difference in the nutritional intake between the treatment and the control, and that protein and vitamin intake was no different in either group, which is to say that both groups met the adequate dietary intake.

The results concluded that a nutritious breakfast does not improve well being nor improve school performance. Perhaps the results of the *Evaluation of the School Breakfast Program Pilot Project* would have coincided with other studies if the study had focused on malnourished children who would benefit more from a nutritious diet rich in protein, vitamins, and minerals to facilitate ideal brain function as indicated by Pollitt et al. (1996). On the other hand, if the study were conducted with children who already consumed a standardized diet or a well-balanced diet, the children were at their optimal level of ideal brain function and would not show much improvement associated with an increase of academic performance (Schoenthaler et al., 2000).

In *The Queensland School Breakfast Project* by Radcliffe and colleagues, the results from the National Nutrition Survey: Selected Highlights, Australia (1995) found that in a sample of students between 12 and 15 years

old, 28% of girls and 12% of boys skip breakfast at least three times per week. Although there is much controversy about school-age students skipping breakfast and school performance, many researchers agree that skipping breakfast has a negative effect on school performance (Pollitt & Matthews, 1998). Nevertheless, Radcliffe et al. (2005) cite that school-age students who are at risk of malnutrition when fed breakfast seem to improve behavior and some cognitive process. All in all, breakfast seems to be an important component in maintaining cognition processes, learning abilities, and attention span, even for a short time (Radcliffe, Ogden, Welsh, Carroll, Coyne, & Craig, 2005; Center on Hunger and Poverty, 2002).

ConAgra Foods and the Center on Hunger and Poverty (CHP) (2002) are organizations fighting a war against hunger among children in the United States. For this purpose, they established the *Feeding Children Better Foundation* in 1999. The CHP indicates that, all things considered, children who suffer from hunger are more likely to get sick. They also conclude that these side effects influence school attendance, and when the children do come to school, they are less interested in learning.

The CHP report states that the relationship between hunger and school performance is far greater than

anticipated. In addition, the CHP report indicates that the detrimental effects of hunger are obvious components that hinder the physical and emotional aspect of a child's life. As a result of hunger, many children suffer from these symptoms which interfere with academic performance. The following is a list reported by CHP on the effects related to hunger and physical and academic performance of children deprived of food:

Psychosocial and Behavioral Effects

- Higher levels of aggression, hyperactivity, and anxiety as well as passivity
- Difficulty getting along with other children
- Increased need for mental health services

Learning and Academic Impact

- Impaired cognitive functioning and diminished capacity to learn
- Lower test scores and poorer overall school achievement
- Repeating a grade in school
- Increased school absences, tardiness, and school suspension (The Center on Hunger and Poverty [CHP], 2002, p. 60.

Thus, CHP (2002) suggests that children suffering from hunger are more distant from their peers and show more emotional behavior problems in school and at home. They denote that hungry children have poorer cognitive abilities and more behavior problems in school because they suffer from hunger symptoms. Studies show that children suffering from hunger are more likely to suffer from hyperactivity and show aggressive behavior (CHP, 2002; Alaimo, 2005; Kleinman et al., 2002).

Children suffering from lack of food are more likely to be suspended from school and have the need for special services. Children lacking appropriate food intake over time become malnourished, which can hinder cognitive development and the ability to comprehend simple motor skill, as well as deteriorate the ability to learn (Alaimo et al., 2001)

Schweitzer (2005) indicates that the divorce rate has increased in the United States, serving as a scaffolding event for poverty, which leads to a number of problems for children of single parents. She states that poverty is the foundation of many social problems including inadequate nutrition. Additionally, she indicates that school-age children without adequate nutrition, especially breakfast, are weary, uninterested, and sluggish. Moreover,

Schweitzer agrees that all these symptoms of inadequate nutrition make it harder for students to concentrate and learn anything.

In addition, Schweitzer (2005) points out that children with these symptoms of inadequate nutrition have a difficult time focusing because their blood sugar is low. Moreover, she notes that oftentimes school-age children who do not consume a proper diet have a difficult time staying on task because they are experiencing stomach pain and gas which are symptoms of hunger. Perhaps school-age children who participate in a breakfast program are unable to get to school on time and miss their breakfast, resulting in being forced to wait until nutrition time which is approximate two hours later (Schweitzer, 2005).

Research indicates that in well nourished or undernourished children, fasting overnight (having dinner, the last meal of the day) and skipping breakfast the next morning, can have detrimental effects on visual attention and processing information to solve problems (Pollitt et al., 1996; Schweitzer, 2005). It is clear that hunger among school-age children will disrupt their attention and interfere with their academic performance (Pollitt et al., 1996; Schweitzer, 2005).

Current research indicates that there is a definite correlation between nutrition and academic performance among school-age children (Pollitt et al., 1996). The vast amount of research indicates that although there are many environmental and biological factors affecting academic performance, the major contributor to poor academic performance is poor nutrition (Shariff et al., 2000). Research also indicates that poor nutrition correlates with poor grades, absenteeism, and behavior problems among school-age children (Shariff et al., 2000).

Summary

Although data from different researchers have been inconsistent, many agree that breakfast programs have demonstrated an increase in attendance and a decrease in tardiness and behavior problems (Thatcher & Lester, 1985). The majority of studies point directly to poor diet or poor nutrition as root factors of behavioral problems and learning disabilities (Schoenthaler et al., 2000). They also indicate that to improve academic performance, one must improve dietary intake or nutrition for school-age children. Several studies show that school breakfast programs have positive effects on scholastic achievements

indicated by improved basic math scores (Schweitzer, 2005; Berkey et al., 2003).

Researchers point out that in order to improve school-age children's attention span and academic performance, students need to consume a nutritious breakfast whether at home or at school (Schweitzer, 2005; Berkey et al., 2003; Levinger, 1996; Pollitt et al., 1996; Alaimo et al., 2001; Galal, & Hulett, 2003; Thatcher, & Lester, 1985; Wolfe et al., 2001). Researchers strongly agree that in order to improve school-age children's attention span and academic performance, there need to be healthy modifications to the consumption of a nutritious breakfast for school-age students (Wolfe et al., 2001; Pollitt et al. 1996). School-age students who consume breakfast before they start their daily academic studies will be less likely to suffer from painful hunger symptoms which interfere with cognitive process and academic performance (Pollitt et al. 1996). The purpose of this study is to determine the actual degree to which poor nutritional practices exist within a school-age population (ages 13-18) in suburban Riverside County, as well as to detect any relationship between dietary practices and academic performance as alluded to in the literature.

CHAPTER THREE

METHODOLOGY

The present study examines the extent of poor nutritional habits and their possible relationship to academic performance in school-age children. Specifically it investigates the relationship between the number of times students consume breakfast and/or lunch per week, the number of times students are absent in a typical month of school, and their grade point average (GPA). This chapter categorizes and describes the study design, population sampling, instruments, data collection, and procedures that were utilized in the process to detect a relationship between poor nutritional practices and the academic performance among school-age children.

Study Design

The purpose of this study is to determine the extent to which poor nutritional practices exist within a school-age population (ages 13-18) in an urban city in Riverside County, as well as to detect the possible relationship between dietary practices and academic performance as suggested in the literature. This is a descriptive survey-based study of a non-random convenience sample in which 469 students from eight high school

science classes were asked to complete a survey on their nutritional practices (e.g., eating breakfast and/or lunch) and their academic performance (e.g. GPA and attendance) and their academic performance (e.g. GPA and attendance).

This particular study addresses three questions:

- 1) What are the dietary practices of high school students?
- 2) What is the academic performance of high school students and their nutritional status?
- 3) What is the relationship between students' eating or skipping breakfast and/or lunch and their academic performance?

Although this study attempts to answer the research questions in a generalized manner aligned with current research, it has limitations. For example, this study utilized a non-random convenience sample of high school students from Norte Vista High School (NVHS) in the Alvord Unified School District (AUSD). Since the participants were students from a single school campus, their nutritional patterns and habits were most probably similar. Additionally, the sample for this study consisted of only teenagers from a single school; the findings do

not reflect the nutritional habits of teenagers as a whole.

Population Sampling

The participants (grade 9-12) were selected from eight science classes at Norte Vista High School. The science teachers offered extra credit points as an incentive to seek participation in completing the questionnaire. The individual science instructors decided how many points they would give as extra credit. In addition, the science instructors decided the date on which they would administer the questionnaire within the two weeks allotted.

The initial population sample consisted of 500 participants. From this sample, only 469 participants were able to take part in this study. Since the population sample consisted of minors (18 and under), science teachers distributed and collected permission forms signed by parents. Hispanic ethnicity was a factor for selecting this particular school because the majority of the literature concentrates on Caucasian populations. Since the participants were under 18 years old they were required to bring signed parental consent forms.

The participants' (n = 469) ethnic background at Norte Vista High School (NVHS) consisted of Hispanics (72.7%), Caucasians (10.7%), Mixed/Others (8.1%), Asians (4.5%), and African Americans (4.1%). The convenience sample was drawn from school-age adolescent males (n = 171) and females (n = 298) enrolled in science classes at Norte Vista High School during the month of November 2006.

This descriptive study was conducted in a school setting. The students' social economic status ranged from low to middle class.

This study was approved in University of San Bernardino, California by the Institutional Review Board (IRB), the Department of Health Science and Human Ecology (HSCI) and the researcher's advisors. The sample size consisted of 171 male and 298 female participants who were asked to participate in this study.

Data Collection and Instrumentation

Participants responded to a two page questionnaire. It consisted of a parent permission form and a debriefing (as mentioned above). To identify the relationship between poor nutritional practice and academic performance, a twelve item questionnaire was developed, entitled

Nutritional Practice and Academic Performance. The three levels of measurements were ordinal, nominal, and scale. The questionnaire consisted of three questions on demographics (ordinal and nominal), seven questions on nutritional practice (scale and nominal), one question on current GPA (ordinal), and one question on the number of absences in a typical month of school year (ordinal). Refer to Appendix B for a complete questionnaire form. The questions were as follow:

1. How many times a week do you eat breakfast?
2. Do you eat breakfast from a free school program?
3. How many times a week do you eat lunch?
4. Do you eat lunch from a free lunch program?
5. Do you usually eat food from a vending machine?
6. Do you usually eat food from the cafeteria?
7. Do you bring lunch from home?
8. What is your current GPA (grade point average)?
9. In a typical month of school, how many days do you miss? (Refer to Appendix B).

Procedures

The researcher contacted the school principal and described the nature and purpose of this study and asked permission to conduct this study (See Appendix C). As soon

as permission was granted for this study, the researcher contacted the science teachers of this campus and informed them of the nature and purpose of the study. After obtaining their permission they were given the surveys to distribute in their science classes. The survey was approved by Institutional Review Board of California State University, San Bernardino.

The science instructors at NVHS read the parent permission form to their students. They also informed their students of the extra credit for participating in this study. In addition, the science instructors informed their students that the parent permission form needed to be signed and returned within the next four days in order to get the full extra credit. At the science teachers' discretion, they informed their students of the date the questionnaire would take place. The parent permission form contained the identification of the researcher, the survey details such as duration of the survey, potential risks and benefits, and contact information if parents had questions about the research and research participants' rights (Refer to Appendix A).

The instructors advised the participants of the duration of the questionnaire, which was one class period. Also, the students were informed of the importance of

taking this survey; this was repeating information from the parent permission consent form. For the purpose of confidentiality, the participants were asked not to write their names on the questionnaire.

Moreover, at the beginning of implementing this questionnaire, the science teachers informed the participants of the participants' right to withdraw their participation at any time without penalty or fear of losing classroom points (as stated in the parent permission form). An alternative assignment was provided by the teacher (reading a book, work on unfinished homework, etc.) for the students not participating in this study. The science teachers collected the completed questionnaires at the end of the class.

Students were first asked to provide demographic information at the beginning of the survey. The participants were then asked to respond to several inquiry questions regarding their nutritional habits, such as how many times they consume breakfast and lunch per week, and whether they receive free or reduced breakfast or lunch. The participants were also asked to provide information regarding their GPA and the number of absences they had during a typical month of a school year.

The researcher and the science instructors arranged in advance for the delivery, distribution, and collection of the signed parent permission forms and completed questionnaires. Information was also collected from a nutritionist from Kaiser Permanente Hospital via email (Refer to Appendix D).

Protection of Human Subjects

The introductory materials consisted of a parent permission form (PPF), which contained identification of the researcher, the survey details, an explanation of the nature and purpose, the duration of the questionnaire, and a consent statement. The questionnaire consisted of questions related to participants' age, gender, and ethnicity for data collection purposes.

The PPF included a debriefing indicating that the participation was voluntary, as well as to indicate that the identity of the participants would be maintained anonymously. The PPF included contact information pertinent questions about this study and the participants' rights (withdrawal of participation at any time without penalty). At the bottom of the PPF, there were two statements with check boxes, one indicating that "Yes" the participant has permission to participate, or "No" the

participant does not have permission to participate in this survey. In addition, it contained a line for the Parent/Guardian Signature, and the date to indicate that the parent and participant had read and understood the description of this study. Also, the signed PPF became an official document indicating that the participants accepted to volunteer or declined to participate in this study.

This study did not have any immediate or long-range risks to the participants. This was a descriptive study and did not employ any experimental procedures. The study utilized a questionnaire to collect data from high school students and interviews with the health nutritionists at Kaiser Permanente Hospital. The nature of the study was descriptive and the survey used in this study examined students' eating habits, grade point average, and absenteeism. Any possible discomfort to the participants could have been due to questions related to free and reduced lunch program. Because students were enrolled in school and attending classes, the participants' general state of mental and physical health was normal. The participants' data was collected anonymously and safeguarded in a secured location off-site; no other researcher had access to these surveys.

Data Analysis

The present study utilized quantitative analyses, including descriptive statistics such as frequencies and Pearson Chi-Square. The data collected was analyzed using the Statistical Package for the Social Sciences (SPSS). The analyses sought to measure the relationship between a variety of nutritional practices and academic performance as defined by GPA and absenteeism. Because this study utilized nominal and ordinal variables, the Pearson Chi-Square Analysis was conducted to detect a relationship between nutritional practices and academic performance.

CHAPTER FOUR

RESULTS

Introduction

The purpose of this chapter is to present and describe the relationships between the variables studied. The data was collected and analyzed using the Statistical Package for the Social Sciences (SPSS). This chapter includes a quantitative description of the population sample and the results from the Pearson Chi-Square Analyses. Tables and figures are provided to supplement the narrative description of data and analyses of results.

Presentation of Findings

This study is based on a non-random convenience sample. The population sample utilized in this study was of 469 students from Norte Vista High School in the Alvord Unified School District, Riverside, California. High school students were selected from the eight science classes at this particular school to participate in a survey related to adolescents' nutritional practices and academic performance. Assistance was received from resident science teachers who distributed and collected parent permission forms from the initial sample of 500

male and female students. The survey was conducted during the fall term of the 2005 school year.

Respondents' Demographics

Table 1 represents the frequency and percent distribution of selected demographic descriptors. The data collected from this population sample indicates a range in age from 13 to 18 years old. Responses to Item 1, "What is your age in years?" indicated that the sample consisted of four 13 year olds (00.9%), 94 of 14 year olds (20.0%), 142 of 15 year olds (30.3%), 148 of 16 year olds (31.6%), 75 of 17 year olds (16.0%), and 6 of 18 year olds (01.3%). Responses to item 2, "What is your gender?" indicates that the final sample in this study consisted of 469 high school students: 171 males (36.5%) and 298 females (63.5%).

Responses to item 3, "What is your ethnicity?" represents the diversity among the population sample, which consisted of Hispanics (72.7%), Caucasians (10.7%), Mixed/Others (8.1%), Asians (4.5%), and African Americans (4.1%).

Table 1. Respondent's Demographics

Item	Variable	N	Frequency (N)	Percent (%)
1.	What is your age in years?	469		
	13 years old		4	00.9
	14 years old		94	20.0
	15 years old		142	30.3
	16 years old		148	31.6
	17 years old		75	16.0
	18 years old		6	01.3
2.	What is your gender?	469		
	Female		298	63.5
	Male		171	36.5
3.	What is your ethnicity?	469		
	Black/African American		19	04.1
	White/non-Hispanic		50	10.7
	Asian/Pacific Islander		21	04.5
	Hispanic		341	72.7
	Mixed/Other		38	08.1

Additionally, responses to item 3 are represented in bar graph in Figure 1. This figure illustrates the ethnic group distribution of the population sample. Moreover, the bar graphs provide a visual representation of percentage distribution by the 341 predominantly Hispanic respondents (72.7%) as well as the minor ethnic groups of 21 Asians (4.5%), and 19 African Americans (4.1%).

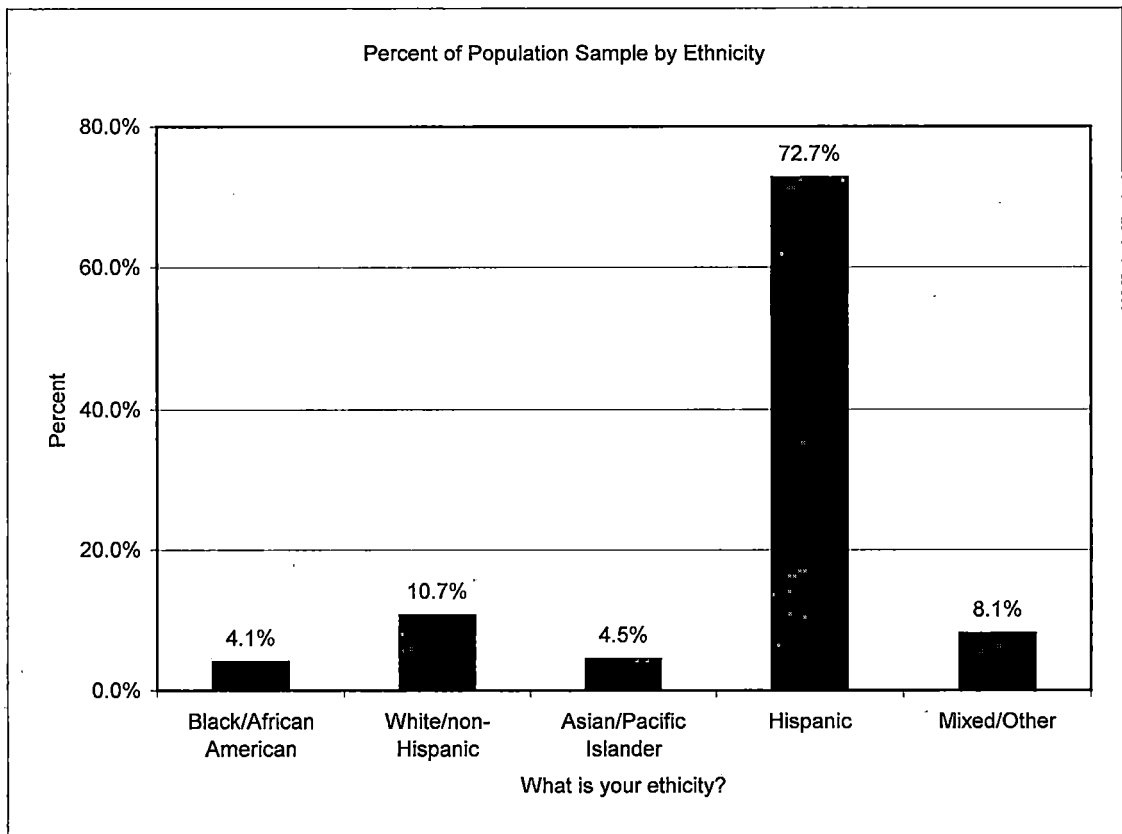


Figure 1. Respondent's Ethnic Distributions

Respondents' Nutritional Practices

Table 2 represents the frequency and percent distribution of items related to respondent's nutritional practices and includes survey items #4-10. The participants were asked to indicate the number of times they consumed breakfast or lunch per week. In addition, the respondents were asked if they consumed breakfast or lunch from a free school program, a vending machine, the cafeteria, or from home. These questions required a "Yes" or "No" response.

With respect to responses to item 5, "Do you eat breakfast from a free school program?" 87 of the participants (18.6%) consumed breakfast from a free school program, 382 of the participants (81.4%) did not eat breakfast from a free school program. For responses to item 6, "How many times a week do you eat lunch?" 242 of the participants (51.6%) consumed lunch 7 days per week, 123 of the participants (26.2%) ate lunch 5 days per week, 39 of the participants (8.3%) consumed lunch three days per week, 24 of the participants (5.1%) consumed lunch two days per week, and 41 of the participants (8.7%) did not eat lunch at all. The data from responses to item 6 is illustrated in Table 2.

In relation to responses to item 7, "Do you eat lunch from a free lunch program?" 133 of population sample (28.4%) consumed lunch from a free lunch program, and 336 of the participants (71.6%) did not consume lunch from a free lunch program, but from other means. Responses to item 8, "Do you usually eat food from a vending machine?" 140 of the participants (29.9%) usually consumed food from a vending machine, and 329 of the participants (71.6%) did not consume food from a vending machine.

Regarding responses to item 9, "Do you usually eat food from the cafeteria?" 199 of the population (42.4%)

Table 2. Respondent's Nutritional Practices

Item	Variable	N	Frequency N	Percent %
4.	How many times per week do you eat breakfast?	469		
	7 days a week		144	30.7
	5 days a week		80	17.1
	3 days a week		52	11.1
	2 days a week		96	20.5
	I do not eat breakfast at all		95	20.7
5.	Do you eat breakfast from a free school program?	469		
	Yes		87	18.6
	No		382	81.4
6.	How many times a week do you eat lunch?	469		
	7 days a week		242	51.6
	5 days a week		123	26.2
	3 days a week		39	8.3
	2 days a week		24	5.1
	I do not eat lunch at all		41	8.7
7.	Do you eat lunch from a free lunch program?	469		
	Yes		133	28.4
	No		336	71.6
8.	Do you usually eat food from a vending machine?	469		
	Yes		140	29.9
	No		329	70.1
9.	Do you usually eat food from the cafeteria?	469		
	Yes		199	42.4
	No		270	57.6
10.	Do you bring lunch from home?	469		
	Yes		41	8.7
	No		428	91.3

consumed lunch from the school cafeteria, and 270 of the sample (57.6%) consumed lunch from elsewhere. For responses to item 10, "Do you bring lunch from home?" 41 of the sample (8.7%) brought lunch from home, and 428 of the population (91.3%) sample did not bring lunch from home, which indicates that this portion of the sample consumed lunch from elsewhere. The details of the data from responses to item #4-10 can be viewed on the Table 2.

In relation to responses to item 4, "How many times per week do you eat breakfast?" 144 of the population sample (30.7%) ate breakfast 7 days per week, 80 of the participants (17.3%) ate breakfast five days per week, 52 of the participants (11.1%) consumed breakfast three days per week, 96 of the participants (20.5%) ate breakfast two days per week, and 97 of the participants (20.7%) responded that they did not eat breakfast at all. These data can be view in Figure 2.

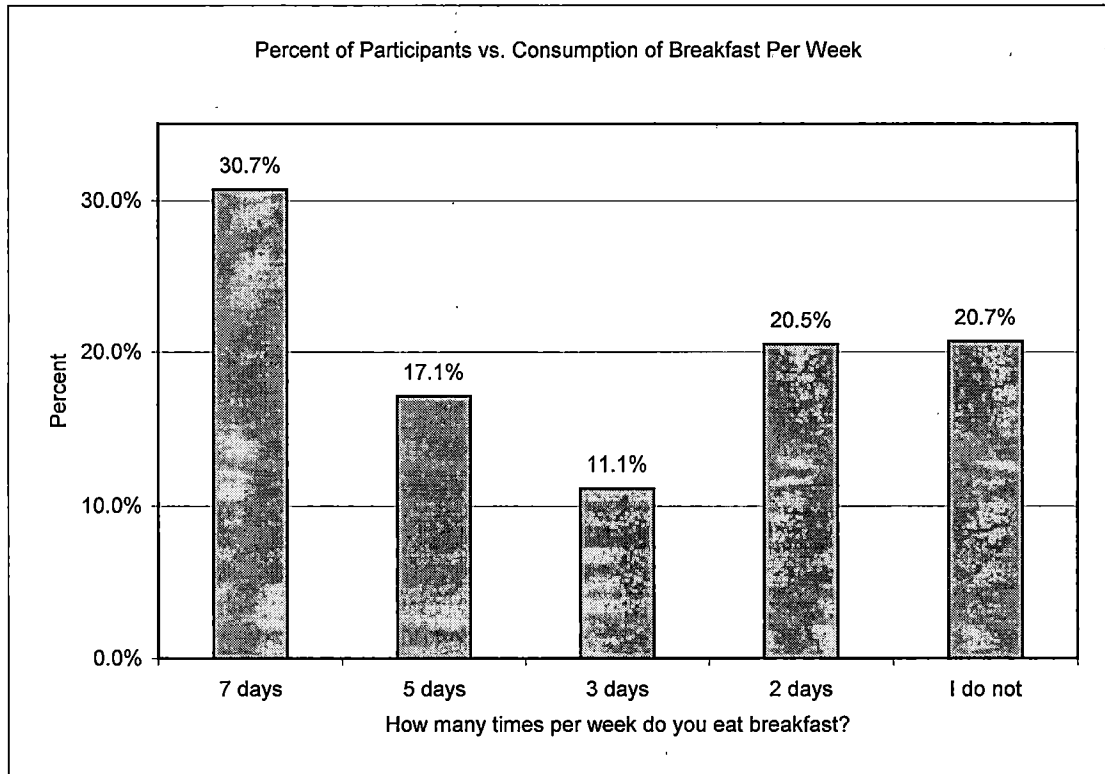


Figure 2. Respondent's Consumption of Breakfast

Figure 3 represents the percent distribution of respondents' consumption of lunch during a school week. Results indicate that 242 participants (51.6%) consumed lunch seven days per week, 123 of the participants (26.2%) ate lunch five days per week, 39 of the participants (8.3%) consumed lunch three days per week, 24 of the participants (5.1%) consumed lunch two days per week, and 41 of the participants (8.7%) did not eat lunch at all.

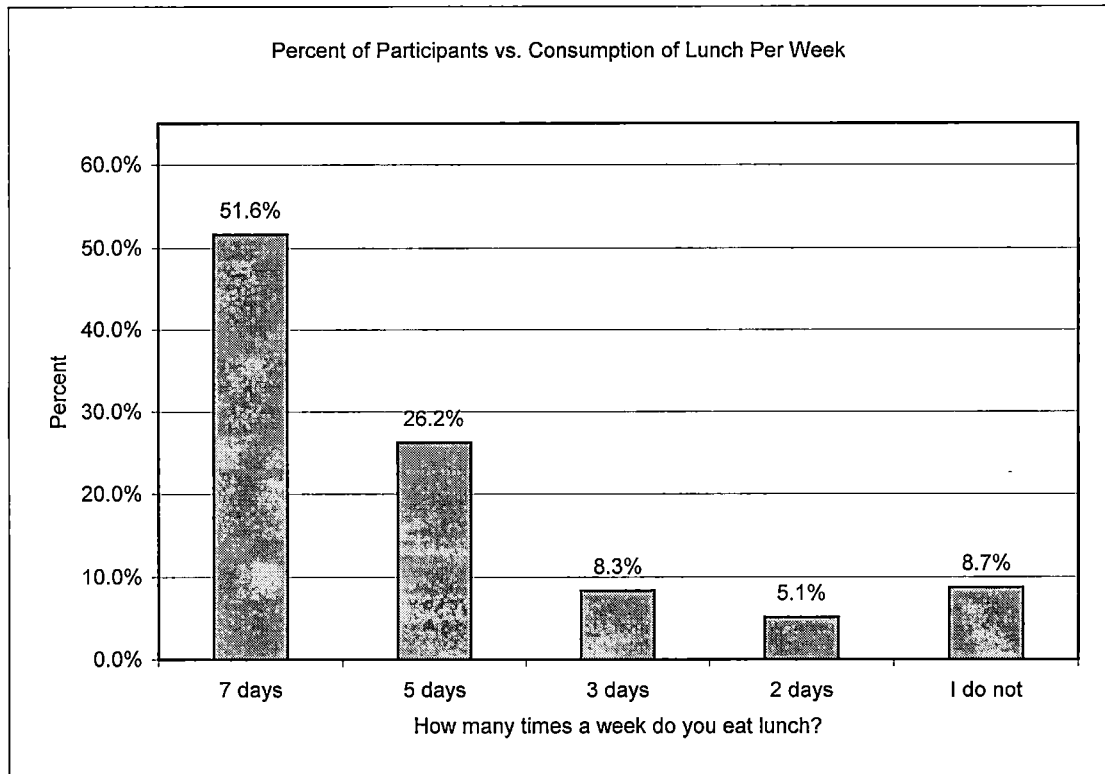


Figure 3. Respondent's Consumption of Lunch

Respondent's Grade Point Average and Absenteeism

Table 3 represents the frequency and percent distribution of items participants answered with respect to their current GPA and their number of absences during a typical school month. Moreover, Table 3 includes responses to item 11 and 12 in which the respondents answered questions regarding their GPA and absenteeism. These questions required the participants to circle the appropriate response.

The responses were then coded in a scale from one through six for data analysis. Responses to item 11, "What is your GPA?" "1" represented 4.0 (A), "2" represented 3.5-3.9 (B+ to A-), "3" represented 3.0 (B), "4" represented 2.5-2.9 (C+ to B-), "5" represented 2.0 (C), "6" represented less than 2.0 (C-) GPA. Responses to item 12, "In a typical month of school, how many days do you miss?" "1" represented zero days, "2" represented one to two days, "3" represented three to four days, "4" represented five to eight days, "5" represented nine to twelve days, "6" represented twelve or more days miss.

In the current study for item 11, "What is your current GPA?" 19 of the participants (4.1%) had a 4.0 GPA, 100 of the participants (21.3%) had a range of 3.5-3.9 GPA, 101 of the participants (21.5%) had a 3.0 GPA, 128 of the participants (27.3%) had a range of 2.5-2.9 GPA, 79 of the participants (16.8%) had a 2.0 GPA, and 42 of the participants (9.0%) indicated to have below 2.0 GPA.

For responses to 12, "In a typical month of school, how many days do you miss?" 241 of the participants (51.4%) responded that they missed zero school days in a typical school month, 141 of the participants (30.1%) missed one to two days, 59 of the participants (12.6%) missed three to four days, 15 of the participants (3.2%)

Table 3. Participant's Grade Point Average and Absenteeism

Item	Variable	N	Frequency (N)	Percent (%)
11.	What is your current GPA?	469		
	4.0		19	4.1
	3.5-3.9		100	21.3
	3.0		101	21.5
	2.5-2.9		128	27.3
	2.0		79	16.8
	<2.0		42	9.0
12.	In a typical month of school, how many days do you miss?	469		
	0 days		241	51.4
	1-2 days		141	30.1
	3-4 days		59	12.6
	5-8 days		15	3.2
	9-12 days		5	1.1
	>12 days		8	1.7

missed five to eight days, five of the participants (1.1%) missed 9-12 days, and eight of the participants (1.7%) missed more than 12 days in a typical month of a school year. These data can be view on Table 3.

Figure 4 characterizes the percent distribution of respondents' GPA. The data indicate that 4.1% of the participants had a 4.0 GPA, 21.3% of the sample had a 3.5-3.9 GPA, 21.5% of the participants had a 3.0 GPA, 27.3% of the sample had a 2.5-2.9 GPA, and 9.0% of the participants had less than a 2.0 GPA.

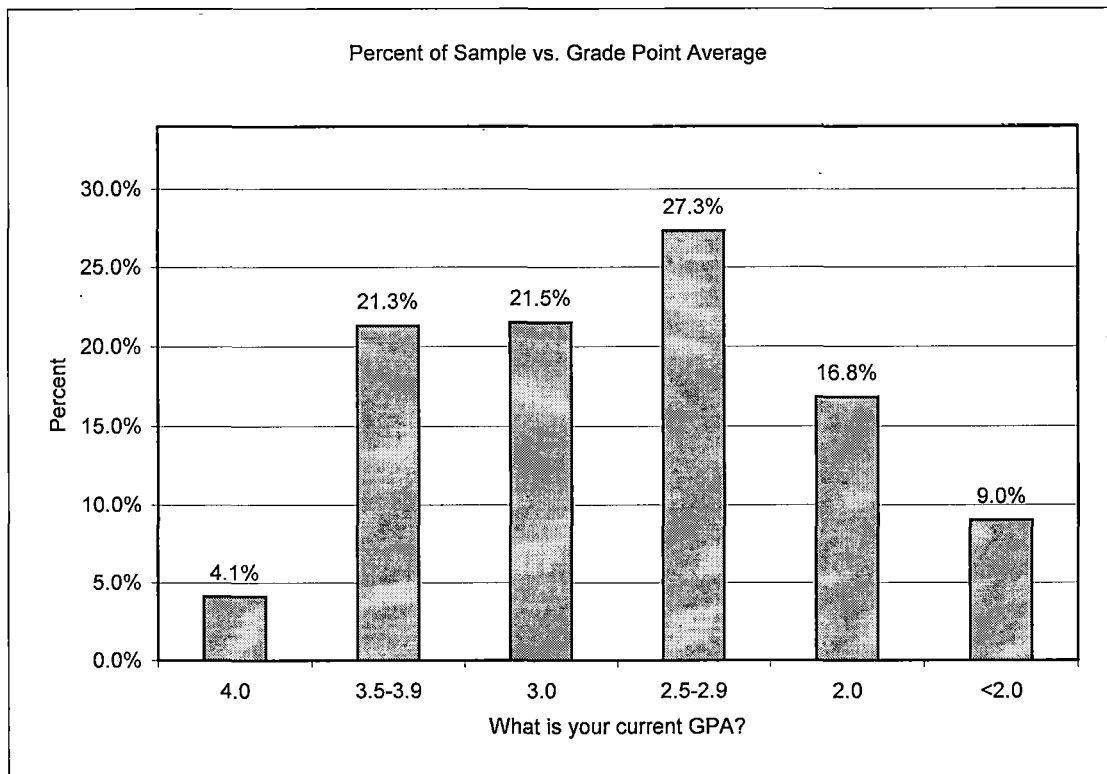


Figure 4. Respondent's Grade Point Average

Figure 5 illustrates the percent distribution of respondent's absenteeism. The results indicate that 51.4% of the participants missed zero days, 30.1% of the participants missed one to two days, 12.6% of the participants missed three to four days, 3.2% of the participants missed five to eight days, 1.1% of the participants missed nine to 12 days, 1.7% of the participants missed more than 12 days in a typical school month.

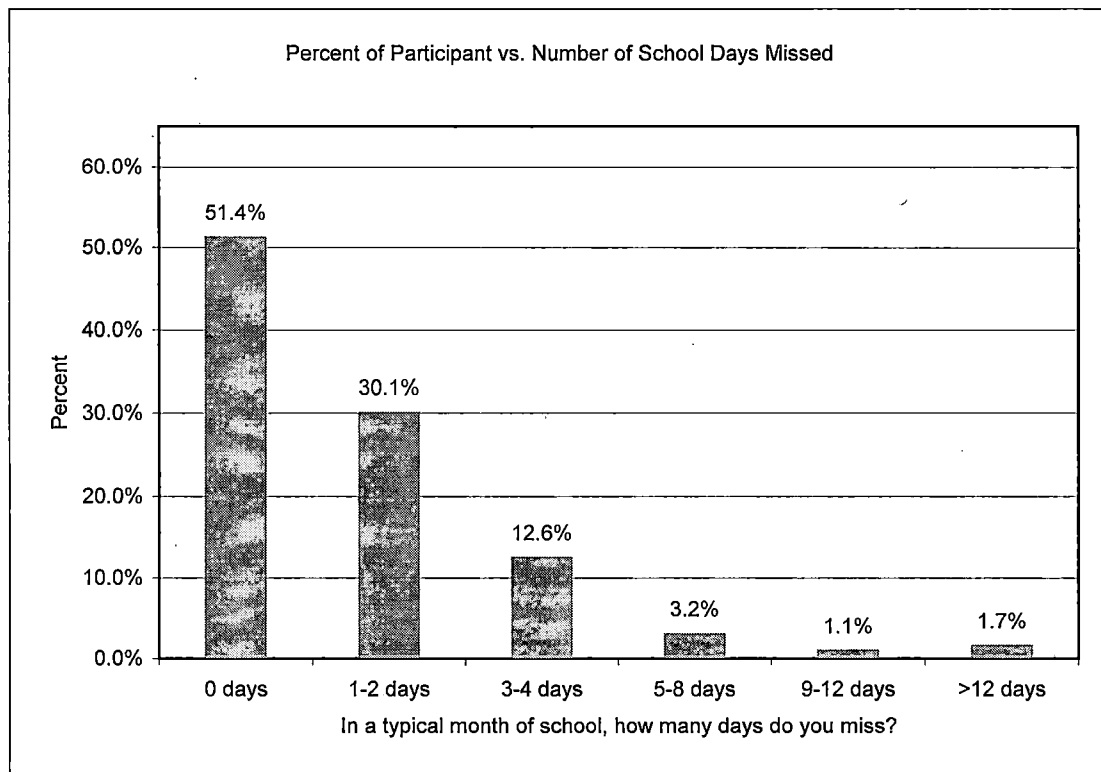


Figure 5. Respondent's Absenteeism

Pearson Chi-Square Tests Results

The Pearson Chi-Square analysis was applied to determine the existence of a relationship between nutritional patterns and academic performance. Initially, possible relationships between gender or ethnicity and academic performance were also examined. Analysis indicated that there is not a statistically significant relationship between gender and GPA (Pearson Chi-Square = 10.46, $p = .063$) although the p value did approach significance. This means that there is no significant difference between males or females with

regards to GPA. However, the Pearson Chi-Square indicated a relationship between ethnicity and GPA (Pearson Chi-Square = 45.39, $p = .001$). This data is illustrated on Table 4.

Table 4. Pearson Chi-Square Tests between Grade Point Average, Gender, and Ethnicity

Variable	Pearson Chi-Square	df	Significance Level
Gender	10.46	5	0.063
Ethnicity	45.39	20	0.001*

* $p < 0.05$

The results from the Pearson Chi-Square analysis provided some interesting information related to students' eating habits and their grade point average. The Pearson Chi-Square analysis indicated that the participants' consumption of breakfast from a free school program was not related to their academic performance as measured by GPA. (Pearson Chi-Square = 4.84, $p = .436$). Also, no relationship existed between participation in the free lunch program and GPA (Pearson Chi-Square = 1.85, $p = .869$). These data suggest that the students' social economic status did not influence their GPA, but further investigation may be necessary.

Moreover, the Pearson Chi-Square showed that no significant relationship existed between the consumption of food from vending machines and GPA (Pearson Chi-Square = 6.76, $p = .239$). Further, the Pearson Chi-Square analysis showed no significant relationship between the consumption of food from the cafeteria and GPA (Pearson Chi-Square = 8.79, $p = .118$). The results indicate that the sources of these meals, whether free or reduced school breakfast or lunch program, vending machine, or school cafeteria, is not significantly related to GPA.

However, a significant relationship was observed between GPA and consumption of lunch from home (Pearson Chi-Square = 14.30, $p = .014$). The results indicated that bringing lunch from home did seem to be related to the students' GPA. The details of these data can be viewed in Table 5.

Table 5. Pearson Chi-Square Tests between Grade Point Average and the Following Variables: Free Breakfast and Lunch from a School Program, Vending Machine Usage, Eating in the Cafeteria, and Bringing Lunch from Home

Variable	Pearson Chi-Square	df	Significance Level
Do you eat breakfast from a free school program?	4.84	5	.436
Do you eat lunch from a free lunch program?	1.85	5	.869
Do you usually eat food from a vending machine?	6.76	5	.239
Do you usually eat food from the cafeteria?	8.79	5	.118
Do you bring lunch from home?	14.30	5	.014*

*p < .05

Additionally, the cross tabulation data in Table 6 suggest a trend that the students who brought lunch from home appeared to have higher GPAs than those who did not bring lunch from home. This may be an indication that perhaps parental supervision and family stability, as reflected in meal preparation, play a role in increased GPA. An additional interpretation may be that students who prepare and bring their own lunches (rather than assuming that the lunch is prepared by a parent) demonstrate higher organizational skills and personal responsibility.

Table 6. Cross Tabulation between Bringing Lunch from Home and Grade Point Average

Variable	What is your current GPA?							Total
		4.0	3.5-3.9	3.0	2.5-2.9	2.0	<2.0	
Do you bring lunch from home?								
Frequency	yes	3	16	11	5	4	2	41
Percentage %		7.3	39.2	26.8	12.2	9.8	4.9	
Frequency	no	16	84	90	123	75	40	428
Percentage %		3.7	19.6	21.0	28.7	17.5	9.3	

The Pearson Chi-Square Test data revealed that from the twelve variables tested, three were determined to have a significant relationship with the participants' GPA. As indicated on Table 5, the Pearson Chi-Square indicated a significant relationship between the consumption of lunch brought from home and the GPA (Pearson Chi-Square = 14.30, $p = .014$). The data did not reveal, however a significant relationship between the how many time per week students ate lunch and their GPA (Pearson Chi-Square = 28.83, $p = .091$). Significance was found in regards to GPA and the number of times per week the participants consumed breakfast (Pearson Chi-Square = 156.78, $p = .001$), as would be expected based on findings reported in the literature (Berkey et al., 2003; Cueto, 2001).

Similarly, a significant relationship was demonstrated between GPA and the number of days the

Table 7. Pearson Chi-Square Tests between Grade Point Average and the Following Variables: Consumption of Breakfast and Lunch; Days Missed in a Typical School Month

Variable	Pearson Chi-Square	df	Significance Level
How many times per week do you eat breakfast?	156.78	20	.001*
In a typical month of school, how many days do you miss?	63.36	25	.001*
How many times per week do you eat lunch?	28.83	20	.091

*p < .05

participants missed in a typical month of school year (Pearson Chi-Square = 63.36, p = .001). With higher levels of absenteeism per month, lower levels of GPA would be expected (see Table 7). This could also be a reflection of parental monitoring and/or self-regulation.

Figure 6 represents the number of days participants consumed breakfast per week and their current GPA. Figure 7 illustrates that the greater the number of days the participants consumed breakfast the higher their GPA, the opposite can be said for the participants who did not consume breakfast at all, their GPA is below 2.0.

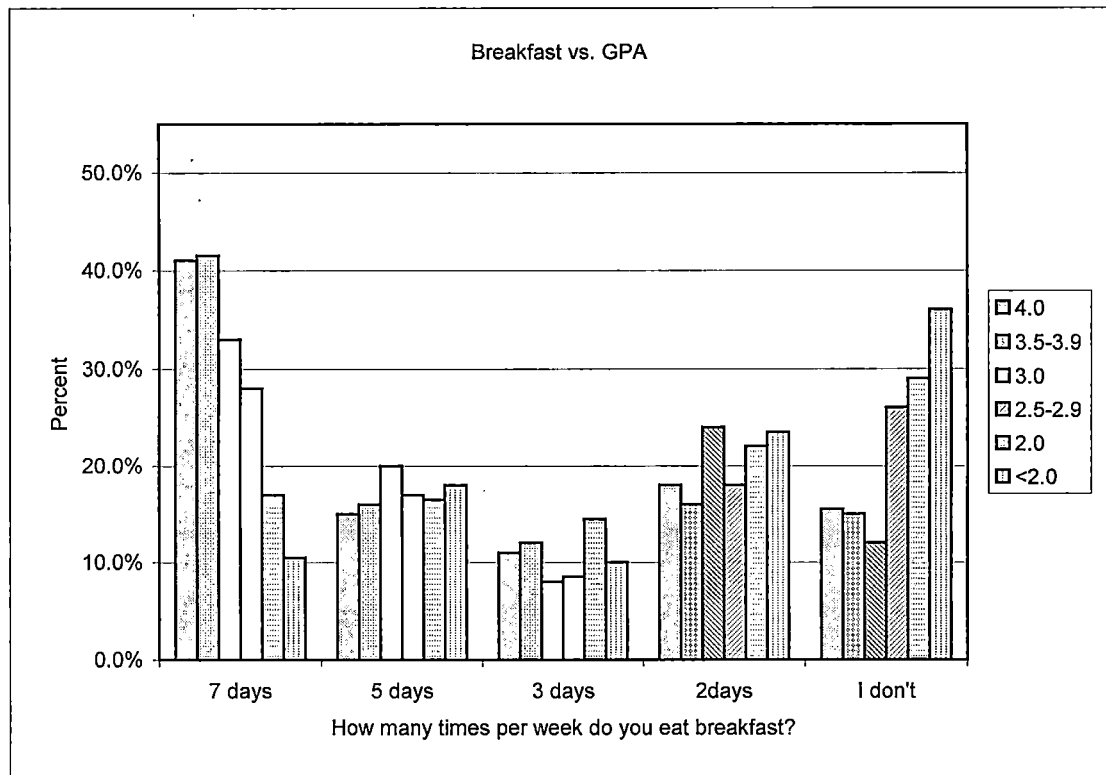


Figure 6. Respondent's Grade Point Average and the Number of Days They Consumed Breakfast

Summary

Chapter Four provided the frequency and percentage for each item and scale found in the questionnaire. Pearson Chi-Square analyses were run to detect possible relationships between selected variables.

Three predictors of GPA were identified a significant relationship:

- 1) A significant relationship was detected between GPA and the number of times per week the participants consumed breakfast.

- 2) A significant relationship was detected between GPA and the number of days the participants missed in a typical month of school year.
- 3) A significant relationship was detected between GPA and whether the participants bring lunch from home.

The Pearson Chi-Square Tests were significant (2-sided) at the 0.05 level

CHAPTER FIVE

DISCUSSION

Introduction

This study focused on whether the consumption of breakfast and lunch are significantly related to students' grade point average. Additionally, this study examined whether absenteeism is significantly related to students' grade point average. The results of the data analyses concluded that there was a significant relationship between grade point average and three of the twelve variables tested. The implications and the limitations of the results are discussed in this section. The recommendations for individual student nutritional practices, as well as school policy and programs, and future research are also discussed.

Discussion

The quantitative data supported the hypotheses implied in the research questions for this study, that there is a significant relationship between students' dietary practices and their grade point average (GPA). Also, there is a significant relationship between students' school attendance and their GPA. Before expanding on the implications of these findings, it is

important to reiterate the limitations of the study, which hinder its generalizability to all students and schools, even in Southern California. Specifically, this study utilized a non-random convenience sample of high school students from Norte Vista High School in Riverside County, California. Also, the participants were students from a single school campus, their nutritional patterns and habits may be mutually influenced, and distinct from those in other regions. Similarly, the participants' ethnic background consisting of 72.7% Hispanic, 10.7% Caucasian, 4.1% African American, 8.1% other, and Asian 4.5%, limit not only the findings' generalizability, but also the study's comparability to other studies which are based largely on Caucasian populations.

However, given these limitations, it is important to note that a low percentage of the participants demonstrated adequate nutritional practices. For instance, a low percentage of the sample (31.1%) indicated they consumed breakfast seven days per week. Just seventeen percent of the sample (17.3%) ate breakfast five days per week. Eleven percent of the sample (11.0%) ate breakfast three days per week. Twenty percent of the sample (20.3%) ate breakfast two days per week. The remaining twenty

percent of the sample (20.3%) indicated that they do not eat breakfast at all.

Implications for Enhanced Nutritional Programs and Practices

The results of this study reinforced the already substantial amount of literature regarding the relationship between the consumption of breakfast and academic performances. These data indicate that skipping breakfast are likely to lead to underperformance among school-aged children. By contrast, it is well documented that eating breakfast may improve academic performance among school-aged children (Alaimo et al., 2001).

Perhaps many parents are not aware of the benefits of their children consuming a wholesome breakfast every day. Hence, classroom teachers and health educators need to inform these parents of the ramifications of students skipping breakfast and the advantages of their consumption a well-balanced breakfast everyday. By consuming a wholesome breakfast one can expect a number of benefits:

1. Students may have enough fuel for maintaining regular blood sugar levels and proper brain and cognitive processes.
2. Students may have more energy to stay focused and be ready to learn.

3. Students' attention level may improve.
4. Students' behavior problems may improve.
5. Students' academic performance may improve.

The determination of a significant relationship between bringing lunch from home and academic performance suggests that a related issue may be that of family or parental stability and oversight. These students come from households in which breakfast is provided, and arrangements for a lunch are made. This finding may be as much about family stability or oversight (or student personal self-regulation in the case of preparing his/her own lunch) as it is about the relationship between nutrition and academic performance.

This study also revealed that there is a significant relationship between GPA and the number of absences students have per month in a school year. With regards to absenteeism, the relationships found in this study indicated that the more days students are absent in a typical school month the lower their GPA. Again, this fact alone should be of special interest to school districts which derive the majority of their funding from the state via the ADA (average daily attendance) records. Increased absenteeism equals less school revenue.

Although not causal or conclusive, these findings would seem to indicate that, if schools are indeed interested in student academic performance and revenue streams that attention must be paid to student's nutritional quality, practices, and training. This study also revealed that GPA is positively and significantly associated with the number of times the participants consumed breakfast, or if they brought lunch from home. These results are consistent with past research. For example, Levinger (1996) indicated that malnutrition is an escalating problem that may be a factor preventing learning among school-aged children.

Recommendations for Nutritional Practices, Policy, and Further Research

Policy makers acknowledge that children who consume breakfast tend to increase academic scores, attention span, and improve temperament (California School Boards Association, & California Project LEAN, 2005). With regard to nutrition, the California School Boards Association indicated that the well being of school-age children is at risk because of poor nutrition. They also revealed that a nutritious diet is the most important component toward school-age children's readiness to learn. As difficult as it may be to isolate the effect that nutrition plays on

the development of the brain and cognitive processes, nutrition is an essential component for the proper function of the brain and the human body as a whole.

The results of this study indicated that the majority of students that consumed breakfast seven days per week also demonstrated a higher GPA. On the other hand, those students who skipped breakfast several days per week or did not consume breakfast at all had lower grade point averages. Findings from this and previous studies should be of special interest to school districts, because of the increasing emphasis on statewide test scores.

The results of this study suggest that it is necessary for nutritionists to collaborate with teachers and administrators in the implementation of nutritional programs that positively impact school-age children's nutritional practices. The implementation of nutritional classes will ensure a solid foundation for school-age children's nutritional practices. The emphasis needs to be towards a consumption of a nutritious diet every day at least three times per day. Most importantly, nutritionists need to educate students and parents with regards to the consumption of a nutritious breakfast each day before beginning the school day activities.

The relationships found in this study indicated that regular dietary patterns among school-age children determine a higher GPA, which may mean that there is a resulting better thought process and brain function. This notion is reinforced by the sizeable amount of literature that good nutrition is essential for stable and proper brain function in school-age children.

Specifically, school district may want to implement a free breakfast program for all students regardless of their ability to pay. Second, school districts may want to focus on improving students' nutritional diet so that it is low in sugar, fat, and salt, but rich in complex carbohydrates and protein. Last, school districts may want to focus on providing students with nutritional practice training or classes starting from kindergarten through elementary school; and continuing with booster classes every year during junior high and high school.

The nutritional practice training may ensure that students continue to make the appropriate healthy food choices and learn to consume food as frequently as every two hours throughout the day. Providing students with a small healthy meal every two hours will ensure that they have enough fuel for maintaining regular blood sugar levels and proper brain and cognitive processes, which in

turn may improve academic performances and statewide test scores.

It may be difficult to presume that poor nutrition alone is responsible for low academic performance, due to several other biological and environmental factors that can account for the lower GPA (Shariff et al., 2000). It is also important to keep in mind that some students that will perform well regardless of nutritional deficits. On the other hand, there may be some students that under-perform even if they consume breakfast seven days a week due to a number of reasons: lack of sleep, illness, or family problems. Nonetheless, it is very important to understand that poor nutrition is an identifiable and substantiated detrimental factor that affects academic performance as illustrated in the literature and reinforced by this study. Fortunately, poor nutrition as detrimental as it may be, researchers indicate that it is the easiest factor to reverse in order to assist students reach their potential of cognitive processes (Bryan et al., 2004).

Future studies are necessary to continue to clarify the interaction of poor nutritional practices and academic performance, as well as to monitor the development of nutritional programs in the schools. Replication of this

study with expanded data on the students' home environment and level of parental involvement and support would be beneficial. In addition, further organizational development research is vital to assist policy makers with the development and implementation of sustainable nutritional programs including both food services and nutrition education.

APPENDIX A
PARENTAL INFORMED CONSENT AND PERMISSION LETTER

Nutritional Practices and Academic Performance

Researcher: Ms. Holt

Written Consent Form / Parental Informed Consent & Permission

Dear Parent/Guardian,

My name is Ms. Holt. I am a science teacher and a graduate student attending California State University San Bernardino. I will be conducting a survey on the relationship between students' nutritional practices and their academic performance. I ask that you grant permission for your son/daughter to participate in the survey.

Survey Details

- The students will be asked several questions on a survey regarding their eating habits, and the type of food they eat. In addition, students will be asked their overall grade point average (GPA) and their daily attendance patterns. Students will also be asked their age, gender and ethnicity for data analysis purposes. The data from the survey will be **anonymous** (no student names or ID's will be gathered) and kept in a location off-site; no other researcher will have access to these surveys. At the end of the survey, students will have the opportunity to ask questions regarding the contents of the survey questionnaire.
- The students' participation in this study is **voluntary**, which means that it is their own choice or decision to complete the survey. Students have the right to withdraw their participation from this study at any time without penalty or loss of grade points from their class. Their classroom teacher will provide the students not participating in this study with an alternative assignment (reading a book or working on class assignments or homework).
- The duration of the students' participation will be **one class period** during a science class.
- The **risks** in this study are low; students might feel uncomfortable answering questions regarding free or reduced lunch programs. The **benefits** of this study might include students and the schools making positive changes toward a more nutritious eating plan to enhance student academic performance.
- This study has **no experimental procedures**; the nature of this descriptive study includes a survey and answering students' questions at the end of the survey.
- The Institutional Review Board at California State University, San Bernardino, has **approved** the content and procedures in this study, including questions contained in the questionnaire. You may contact Dr. Kim Clark, faculty supervisor of this descriptive study at 909.537.5323 for answers to pertinent questions about the research and research participants' rights.

*Thank you for your cooperation in this study, please sign and return this consent form to your child's teacher not later than **November 18, 2005.***

☐ Yes, my son/daughter _____ has permission to participate in this survey and the class discussion

☐ No, my son/daughter _____ does not have permission to participate in this survey and the class discussion

Parent/Guardian Signature _____ **Date** _____

APPENDIX B

NUTRITIONAL PRACTICES AND ACADEMIC PERFORMANCE

Nutritional Practices and Academic Performance
Researcher: Ms. Holt

Please answer the following questions to the best of your knowledge. This information will be kept strictly confidential. DO NOT SIGN YOUR NAME.

1.	What is your age in years?	<input type="checkbox"/> 13	<input type="checkbox"/> 14	<input type="checkbox"/> 15	<input type="checkbox"/> 16	<input type="checkbox"/> 17	<input type="checkbox"/> 18
2.	What is your gender? check one	<input type="checkbox"/> Female	<input type="checkbox"/> Male				
3.	What is your ethnicity? check one	<input type="checkbox"/> Black/African-American	<input type="checkbox"/> White/not Hispanic				
		<input type="checkbox"/> Asian/Pacific Islander	<input type="checkbox"/> Hispanic	<input type="checkbox"/> Mixed/Other			
4.	How many times a week do you eat breakfast ?	<input type="checkbox"/> 7 days a week	<input type="checkbox"/> 5 days a week				
		<input type="checkbox"/> 3 days a week	<input type="checkbox"/> 2 days a week?	<input type="checkbox"/> I do not eat breakfast at all			
5.	Do you eat breakfast from a free school program?	<input type="checkbox"/> Yes	<input type="checkbox"/> No				
6.	How many times a week do you eat lunch ?	<input type="checkbox"/> 7 days a week	<input type="checkbox"/> 5 days a week				
		<input type="checkbox"/> 3 days a week	<input type="checkbox"/> 2 days a week?	<input type="checkbox"/> I do not eat lunch at all			
7.	Do you eat lunch from a free lunch program?	<input type="checkbox"/> Yes	<input type="checkbox"/> No				
8.	Do you usually eat food from a vending machine?	<input type="checkbox"/> Yes	<input type="checkbox"/> No				
9.	Do you usually eat food from the cafeteria?	<input type="checkbox"/> Yes	<input type="checkbox"/> No				
10.	Do you bring lunch from home?	<input type="checkbox"/> Yes	<input type="checkbox"/> No				
11.	What is your current GPA (grade point average)? Circle one.						
	4.0(A) 3.5-3.9(B+ to A-) 3.0(B) 2.5-2.9(C+ to B-) 2.0 (C) Less than 2.0(C-)						
12.	In a typical month of school, how many days do you miss ? Circle one.						
	In a month, I miss: 0 days 1-2 days 3-4 days 5-8 days 9-12 days 12 or more days						

Thank you for completing this survey. Please return it to the teacher.

APPENDIX C
PRINCIPAL PERMISSION LETTER

July 13, 2005

To: The Institutional Review Board at California State University, San Bernardino

Subject: Agreement to conduct a study on the relationship between students' nutrition and students' academic performance

I am pleased to write this letter for Edna Holt. I understand that Edna Holt will be conducting a study in which students will be asked several questions on a survey, which will include items regarding the students eating habits, the type of food they eat as well as their overall grade point average, and their daily attendance from the previous academic school year. In addition, I know that the students will have the opportunity to ask questions at the end of the survey regarding healthy eating habits as it relates to the survey.

I have reviewed the survey and parental consent form & permission letter. I am giving permission to Edna Holt the researcher to conduct this study in the science classes in the Norte Vista High School of the Alvord Unified School District.

Sincerely,

Santos Campos
School Principal
Norte Vista High School
951.351.9201

APPENDIX D
KAISER PERMANENTE NUTRITIONIST EMAIL
QUESTIONNAIRE

Researcher Edna Holt
The Relationship Between Students' Nutrition And Academic Performance

Dear Colleagues, (Dietician/Nutritionist/Health Educator)

As part of the requirement for securing my Master's Degree from California State University, San Bernardino, I am seeking your opinions in regards to school-age students' eating habits. Thus, the attached questions seek your perception regarding students' nutrition as it relates to their academic performance. All survey responses will be kept confidential. Please answer the following questions to the best of your ability. Thank you for your cooperation.

1. Do you think that if school-age children eat breakfast every morning could help them improve their academic performance? ☐YES ☐NO

Why?

Why not?

2. Do you think that if school-age children eat lunch every day could help them improve their academic performance? ☐YES ☐NO

Why?

Why not?

3. Do you think that if school-age children skip breakfast or lunch could negatively affect their academic performance? ☐YES ☐NO

Why?

Why not?

4. In your opinion, do school-age children eat a balanced meal?

5. In your opinion, what should a balance meal include?

6. To your knowledge, are the school meals consistent with balanced nutritional guideline?

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